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(54) Title: METHOD FOR CONDUCTING A LAUNDRY BUSINESS WITH CARBON DIOXIDE

(57) Abstract: This invention is directed to a method for conducting a laundry business. The laundry business operates by isolating acetate containing and non-acetate containing fabrics from each other. The acetate containing fabrics are then subjected to a dry cleaning process without carbon dioxide and the non-acetate containing fabrics are subjected to a dry cleaning process with carbon dioxide. Also, the laundry business offers a laundry service that uses detergent and water.

METHOD FOR CONDUCTING A
LAUNDRY BUSINESS WITH CARBON DIOXIDE

5 Related Applications

This application is related to a copending patent application, Attorney Docket No. C6577(V) entitled "Method for Conducting a Laundry Business to Clean Low Glass Transition
10 Temperature Fabrics", the disclosure of which is incorporated herein by reference and simultaneously filed herewith.

Field of the Invention

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This invention is directed to a method for conducting a laundry business. More particularly, the invention is directed to a method for cleaning fabrics wherein soiled laundry fabrics are picked up, cleaned and delivered to the consumers
20 requesting service.

Background of the Invention

25 Many commercial dry cleaning establishments exist around the world today. Such establishments require that the consumer drop off his or her soiled clothing at the dry cleaning establishment and pick up the clothing at a later time after the soiled clothing has been cleaned.

30

Other cleaning businesses clean ordinary laundry (e.g., laundry cleaned with detergent and water). Like the dry cleaning establishments, these cleaning businesses also require that the consumer drop off his or her soiled clothing at the

cleaning business and pick up the clothing at a time after the soiled clothing has been washed.

Conventional cleaning facilities, unfortunately, are not
5 fully responsive to the needs of families subject to the
demands in the new millenium. This is true because most
cleaning facilities require that the customer drop off and pick
up his or her own clothes. Also, most cleaning facilities are
not equipped to clean both ordinary laundry and laundry
10 requiring dry cleaning. Moreover, conventional dry-cleaning
facilities are beginning to become less desirable since they
typically clean garments with environmentally unfriendly
solvents like perchloroethylene. This invention, therefore, is
directed to a method for conducting a laundry business. The
15 laundry business contains the capacity to pick up, clean and
deliver laundry to customers requesting service. The laundry
business provides environmentally friendly dry cleaning
alternatives, is cost competitive and does not cause damage to
soiled laundry fabrics targeted for cleaning.

20

Background Material

Efforts have been disclosed for dry cleaning with
25 environmentally friendly solvents. In U.S. Patent No.
5,676,705, a dry cleaning method which employs densified carbon
dioxide is described.

Other efforts have been disclosed for dry cleaning with
30 carbon dioxide. In U.S. Patent No. 5,683,473, dry cleaning
with carbon dioxide and a surfactant is described.

Still further, U.S. Patent No. 5,683,977 discloses a superior dry cleaning system with carbon dioxide and a surfactant adjunct.

5

Summary of the Invention

In a first aspect, this invention is directed to a method for conducting a laundry business comprising the steps of:

10

- (a) collecting soiled laundry fabric from a customer at a residential home or a customer at a business and transporting the soiled laundry fabric collected to a cleaning facility of the laundry business, or
- 15 (b) gathering soiled laundry fabric from a central laundry drop off location, the central laundry drop off location being within the cleaning facility of the laundry business or at a location which is at a driving distance of the cleaning facility of the laundry
- 20 business,
- (c) or both;
- (d) cleaning the soiled laundry fabric to produce clean laundry fabric; and
- 25 (e) delivering the clean laundry fabric to the customer or allowing the customer to pick up the clean laundry fabric at a pick up location,

with the proviso that the laundry business is of the type whereby a first portion of soiled laundry fabric is cleaned
30 with a dry cleaning technique that uses a densified gas and a second portion of soiled laundry fabric is cleaned with a dry cleaning technique that does not comprise carbon dioxide wherein the first portion of soiled laundry fabric does not

comprise a portion having a blend with greater than about 40.0% acetate or a portion having about 100% acetate, or both.

In a second aspect, this invention is directed to a
5 laundry business that separates clothing comprising a portion with greater than about 40.0% acetate from clothing that does not comprise a portion with greater than about 40.0% acetate wherein the clothing with greater than about 40.0% acetate is not cleaned with a solvent which comprises a carbon dioxide.

10

In a third aspect, this invention is directed to the laundry business as described in the first and second aspects of this invention further comprising the step of separating a third portion of soiled laundry fabric to be cleaned with water
15 and detergent (e.g., ordinary laundry).

In a fourth aspect, this invention is directed to a laundry business in a building for carrying out at least a portion of the laundry businesses set forth in the first three
20 aspects of this invention.

Detailed Description of the Preferred Embodiments

25 As noted above, it has become increasingly difficult in the new millenium for family members to manage basic household chores. Moreover, consumers are very concerned with the environment and particularly prefer that harmful chemicals are not used to, for example, dry clean their clothing. Attempts
30 have been made to dry clean clothing with environmentally friendly solvents. However, certain friendly solvents, such as densified gases like densified carbon dioxide, have demonstrated that fabric shrinkage can occur when the soiled

laundry fabric being cleaned in carbon dioxide comprises a portion with greater than about 40.0% acetate. The superior business method described in this invention is designed to make household chores much less burdensome for the consumer, while
5 at the same time cleaning fabrics in a manner which is safe for the environment as well as the fabrics being cleaned.

The soiled laundry fabric which is accumulated via this invention is limited only to the extent that the fabric may be
10 cleaned in a commercial fabric cleaning facility or in a household machine. Such soiled laundry fabric includes men's and women's suits, coats, rugs, slacks, curtains, upholstery and shirts. The soiled laundry fabric may be collected from the consumer at his or her home, place of business, or both.
15 The collecting of the soiled laundry fabric is achieved by the laundry business of this invention via delivery personnel utilizing delivery vehicles such as vans. The soiled laundry fabric which is collected by the delivery personnel is delivered to a cleaning facility of the laundry business of
20 this invention (usually in, for example, laundry sacks).

Soiled laundry fabric may also be gathered at a central laundry drop off location. The central laundry drop off location may be directly within the cleaning facility of the
25 laundry business or at a location which is at a driving distance from the cleaning facility. If, for example, the consumer drops soiled laundry fabric off at a central laundry drop off location not located within the cleaning facility of the laundry business, delivery personnel will pick up and
30 deliver such soiled laundry fabric to a cleaning facility of the laundry business. As used herein, central laundry drop off location is defined to include a box or bin (e.g., container or locker) capable of holding soiled laundry fabric as well as an

actual laundry store with or without laundry cleaning machines. Cleaning facility, as used herein, is defined to include an actual laundry store with laundry cleaning machines or a facility with laundry cleaning machines and no actual laundry store. Pick up location, as used herein, is defined to include any box, bin, building or store front where the consumer can pick up his or her cleaned fabric. Driving distance is meant to mean less than about 250 kilometers. Laundry, as used herein, is defined to mean the cleaning of fabrics via emersion in water or non-aqueous solvent.

Regarding the soiled laundry fabric accumulated by the laundry business of this invention (e.g., the soiled laundry fabric collected by the laundry business and gathered at the drop off locations), such soiled laundry fabric accumulated may be monitored by any inventory control means known in the art. Such inventory control means include stamping the soiled laundry fabrics with a heat stamp, using conventional bar codes, using conventional paper tags and receipts, labeling laundry sacks (e.g., especially when the consumer uses a laundry drop off location) or using conventional radio frequency inventory chips such as those made commercially available by SCS Corporation.

Subsequent to accumulating the soiled laundry fabric, the soiled laundry fabric comprising a portion with a blend with greater than about 40.0% acetate or a portion having about 100% acetate, or both is separated from the soiled laundry fabric that does not comprise a portion with a blend with greater than about 40.0% acetate or a portion having about 100% acetate. This separation is achieved by, for example, a laundry technician reading the labels on the soiled laundry fabrics. Also, if soiled laundry fabrics are accumulated that do not

require dry cleaning, such fabrics are separated by, for example, the same laundry technician. Optionally, the laundry technician may use an analytical device such as an infrared spectrophotometer or an ultra violet/visible spectrophotometer 5 to assist in identifying the fabrics.

Therefore, three portions of soiled laundry fabric may be accumulated by the laundry business of this invention. The first portion of soiled laundry fabric and the second portion 10 (both requiring dry cleaning) of soiled laundry fabric are, again, soiled laundry fabric without a portion with a blend with greater than about 0.5% acetate or a portion having about 100% acetate and soiled laundry fabric comprising a portion with a blend having greater than about 40.0% acetate or a 15 portion having about 100% acetate, or both, respectively. The third portion of soiled laundry fabric is fabric not requiring dry cleaning.

All percents as used in this invention are by weight. 20 Therefore, by illustration, a woman's suit jacket comprising a lining (portion) which is about 100% by weight acetate or a collar (portion) which is a blend comprising greater than about 40.0% by weight acetate, or both, would not be dry cleaned via this invention with carbon dioxide.

25

In this invention, the first portion of the soiled laundry fabric that does not comprise greater than about 40.0% acetate as described above (and does require dry cleaning) is preferably cleaned with a densified gas such as densified 30 carbon dioxide (other densified gases may be used and they include propane as described in U.S. Patent Nos. 5,158,704 and 5,266,205, the disclosures of which are incorporated herein by reference). Such a densified gas is a gas at standard

temperature and pressure and is the preferred solvent employed in this invention to clean soiled laundry fabric that, again, does not comprise greater than 40.0% acetate as described above. Moreover, the densified gas may be, within the dry
5 cleaning process, a gas, liquid or supercritical fluid depending upon how densified the gas is (how much pressure is applied at a given temperature) in the laundry system (e.g., apparatus) of the cleaning facility used in the laundry business of the invention.

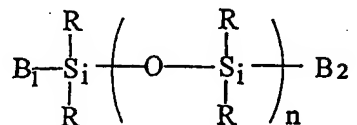
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When carbon dioxide is used to clean the soiled laundry fabric not comprising a portion with a blend with greater than about 40.0% acetate or a portion having about 100% acetate, or both, surfactant is typically used. Such a surfactant can be
15 an end-functionalized polysiloxane like those represented in general, by the formula B_1-A-B_2 wherein B_1 and B_2 are each independently an end-functional group and A is a polysiloxane such as polydimethylsiloxane (having an average weight molecular weight of about 75 to about 400,000).

20

The end-functionalized polysiloxanes typically are represented by the formula:

25



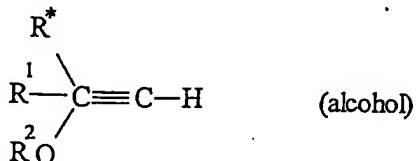
wherein n is an integer from about 1 to about 10,000,
30 preferably from about 1 to about 100.

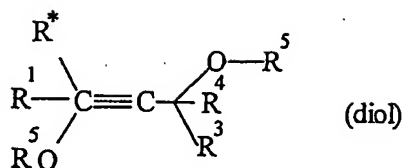
At least one, and preferably, both of B₁ and B₂ are solvent phobic groups such as lipophilic or hydrophilic (e.g., anionic, cationic) groups, but are not CO₂-philic groups. Each R is independently an alkyl, aryl or haloalkyl, with perfluoroalkyl, C₁-C₄ alkyls, phenyl and trifluoropropyl being the preferred R groups.

Regarding B₁ and B₂, such end-functional groups may be derived from silicones with reactive groups that yield end-functional materials upon contact with a substrate. Illustrative examples of such reactive groups include vinyl, hydride, silanol, alkoxy/polymeric alkoxide, amine, epoxy, carbinol, methacrylate/acrylate, mercapto, acetoxy/chlorine/dimethylamine moieties.

A more detailed description of the types of end-functionalized polysiloxanes which may be used in the laundry business of this invention may be found in WO 99/10587, the disclosure of which is incorporated herein by reference.

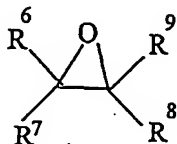
Other surfactants which may be employed in carbon dioxide when soiled fabric not comprising acetate (as described above) is being cleaned include those generally classified as acetylenic alcohols or diols as represented by the formulae below, respectively:





5

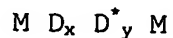
wherein R^* , R^1 , R^3 and R^4 are each independently hydrogen atoms or linear or branched alkyl groups comprised of 1 to 38 carbons, and R^2 and R^5 are each hydrogen atoms or hydroxyl terminated polyalkylene oxide chains derived from 1 to 30 alkylene oxide monomer units of the following structure:



15

wherein R^6 , R^7 , R^8 and R^9 are each independently hydrogen atoms, linear or branched alkyl groups having about 1 to about 5 carbons, or phenyl.

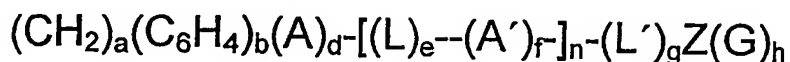
The most preferred surfactants which may be used in this invention when carbon dioxide is used to clean soiled laundry fabrics that do not comprise a blend with greater than 0.5% acetate or a portion with about 100% acetate include those having the formula:



wherein M is a trialkylsiloxyl end group, D_x is a dialkylsiloxyl backbone which is solvent-philic and D_y^* is one or more alkylsiloxyl groups which are substituted with a

30

solvent-phobic group wherein each solvent phobic group is independently defined by the formula:



5

wherein a is 1-30,

b is 0 or 1,

C_6H_4 is unsubstituted or substituted with a C_{1-10} alkyl or alkenyl, and A and A' are each independently a linking moiety
10 representing an ester, a keto, an ether, a thio, an amido, an amino, a C_{1-4} fluoroalkyl, a C_{1-4} fluoroalkenyl, a branched or straight chained polyalkylene oxide, a phosphate, a sulfonyl, a sulfate, an ammonium, and mixtures thereof,

L and L' are each independently a C_{1-30} straight chained or
15 branched alkyl or alkenyl or an aryl which is unsubstituted or substituted,

E is 0-3,

F is 0 or 1,

N is 0-10,

20

G is 0-3,

O is 0-5,

Z is a hydrogen, carboxylic acid, a hydroxy, a phosphato, a phosphate ester, a sulfonyl, a sulfonate, a sulfate, a branched or straight-chained polyalkylene oxide, a nitryl, a glyceryl, an
25 aryl unsubstituted or substituted with a C_{1-30} alkyl or alkenyl, a carbohydrate unsubstituted or substituted with a C_{1-10} alkyl or alkenyl or an ammonium,

G is an anion or cation such as H^+ , Na^+ , Li^+ , K^+ , NH_4^+ , Ca^{+2} , Mg^{+2} , Cl^- , Br^- , I^- , mesylate, or tosylate, and

30

h is 0-3.

Such surfactants are described in U.S. Patent Nos. 5,676,705, 5,683,977, 5,683,473, commonly assigned to Lever Brothers Company, a Division of Conopco, Inc., the disclosures of which are incorporated herein by reference.

5

When performing the actual cleaning of the soiled laundry fabrics not comprising a portion with a blend with greater than about 40.0% acetate or a portion with about 100% acetate, the cleaning process takes place with the preferred densified gas is 10 carbon dioxide that is maintained at a temperature from about 0.0 to about 100°C, and preferably, from about 5.0 to about 40.0°C, and most preferably, from about 8.0°C to about 30°C, including all ranges subsumed therein. Moreover, when the densified gas (e.g., carbon dioxide) is used, it is typically 15 maintained at a pressure from about 14.7 to about 10,000 psi, and preferably from about 250 to about 4,000 psi, and most preferably, from about 650 to about 900 psi, including all ranges subsumed therein.

20 When a densified gas such as carbon dioxide is used to clean the soiled laundry fabrics of this invention that do not comprise a portion with a blend with greater than about 40.0% acetate or a portion with about 100% acetate, the machine which is employed for cleaning is well known in the art. Such a 25 machine typically comprises a gas supply, cleaning tank and condenser. The machine may further comprise a means for agitation; particularly, when the contaminated substrate targeted for removal is a fabric. The means for agitation may be, for example, a mechanical device like a mechanical tumbler, 30 or a gas-jet agitator. The art recognized machines which may be used in this invention (e.g., when carbon dioxide is used) may be found in U.S. Patent Nos. 5,943,721, 5,925,192,

5,904,737, 5,412,958, 5,267,455 and 4,012,194, the disclosures of which are incorporated herein by reference.

When carbon dioxide is employed, the amount of surfactant used is from about 0.01% to about 10.0%, and preferably, from about 0.02% to about 2.0% by weight surfactant based on total weight of surfactant and carbon dioxide, including all ranges subsumed therein.

10 In a most preferred embodiment, a polar solvent, such as water, is employed along with the surfactant in the cleaning system comprising carbon dioxide. The amount of polar solvent used is typically from about 0.5 to about 8.0 times, and preferably from about 1.0 to about 5.0 times, and most
15 preferably, from about 1.5 to about 2.5 times the amount of surfactant used in the cleaning system comprising carbon dioxide. Often, the polar solvent is used so that reverse micelles may be formed within the cleaning system. The reverse micelles are formed often because the surfactant has a carbon
20 dioxide-philic portion and a carbon dioxide-phobic portion wherein the carbon dioxide phobic portion dissolves in a resulting polar solvent (e.g., water) core of the resulting reverse micelle.

25 When soiled fabric (requiring drycleaning) comprising a portion with a blend with greater than about 40.0% acetate or a portion comprising about 100% acetate, or both, is cleaned via this invention, such cleaning may take place in a solvent like a hydrocarbon or a silicon comprising solvent.

30

There generally is no limitation with respect to the type of hydrocarbon which is used to clean the soiled laundry fabric comprising a portion with a blend with greater than about 40.0%

acetate or a portion with about 100% acetate of this invention except that the hydrocarbon may be used in a dry cleaning machine to clean fabric. Such a hydrocarbon includes a biodegradable functionalized hydrocarbon generally classified
5 as a azeotropic solvent. The azeotropic solvent often comprises alkylene glycol alkyl ethers, like propylene glycol tertiary-butyl ether, and is described in U.S. Patent No. 5,880,250, the disclosure of which is incorporated herein by reference. Moreover, as used herein, biodegradable hydrocarbon
10 functionalized hydrocarbon is defined to mean a biodegradable hydrocarbon comprising at least one member selected from the group consisting of an aldehyde, ketone, alcohol, alkoxy, ester, ether, amine, amide, and sulfur comprising group.

15 Other hydrocarbons which may be used in this invention include aliphatic and aromatic hydrocarbons, and esters and ethers thereof, particularly mono and di-esters and ethers (e.g., Exxon Isopar L, Isopar M, Isopar V, Exxon Exxsol and especially Exxon DF 2000). These solvents are well known and
20 made commercially available by Exxon.

It should be noted that hydrocarbon as used herein is defined to include halogenated (substituted) hydrocarbon such as perchloroethylene. However, while such a halogenated
25 hydrocarbon may be used in this invention, it is not preferred and is not required because of its (i.e., the halogenated hydrocarbon like perchlorethylene) impact on the environment.

As to the silicon comprising solvent which may be used in
30 this invention, such a solvent is typically a commercially available cyclic-siloxane based solvent made available from Green Earth Cleaning, LLC. The cyclic-siloxane based solvent is generally one having a flash point over about 65°C, with

octamethyl-cyclotetrasiloxane and decomethyl-cyclopentasiloxane being most preferred. A more detailed description of such a commercially available siloxane comprising solvent may be found in U.S. Patent No. 5,942,007, the disclosure of which is
5 incorporated herein by reference.

A preferred and superior silicon comprising solvent which may be used in this invention includes those classified as linear silicon comprising oligomers. These oligomers are
10 typically siloxanes with molecular weights (Mw) ranging from about 100 to about 3000. Such linear silicon comprising solvents are made commercially available by The General Electric Company and Dow Corning (e.g., Dow Corning 200(R) Fluids). A more detailed description of the linear silicon
15 comprising solvent which may be used in this invention may be found in U.S. Patent Application Serial No. 09/449,896, the disclosure of which is incorporated herein by reference.

When the solvent employed (to clean acetate comprising
20 soiled fabrics) is a hydrocarbon or silicon comprising solvent, the cleaning machine which may be used typically comprises a solvent tank, a cleaning tank, a distillation tank, a filter and solvent exit. Such machines are well known, typically used in facilities that dry clean with perchloroethylene, and are
25 described in U.S. Patent No. 4,712,392, the disclosure of which is incorporated herein by reference.

It is noted that it is preferred for clothing comprising a portion with a blend with greater than about 40.0% acetate to
30 not be cleaned with carbon dioxide. However, if desired (but not required), this lower acetate limit may be increased to a fabric with a portion having greater than about 70.0% by weight acetate (this increase may be desired since acetate comprising

fabrics tend to shrink more as the amount of acetate increases). Also, it is preferred that the second portion of soiled laundry fabric is cleaned with a technique that does not comprise carbon dioxide. If desired, however, a technique with 5 from about more than zero and up to about 5.0% carbon dioxide (based on total weight of solvent) may be used to clean the second portion of the soiled laundry fabric. It is further noted that if desired (but not required), the lower acetate limit may be decreased to 25.0% if limited fabric shrinkage is 10 not a detriment.

Regarding the ordinary laundry accumulated via this laundry business, such ordinary laundry may be washed in conventional machines made by, for example, Whirlpool and 15 Maytag. The preferred detergents used when ordinary laundry is washed via this invention are all, Wisk and Surf, all of which made commercially available by Unilever. Also, industrial laundering machines that use detergents made commercially available by DiverseyLever may be employed.

20

The examples which follow are provided to illustrate and facilitate an understanding of the present invention. Therefore, the examples are not meant to be limiting and modifications which fall within the scope and spirit of the 25 claims are intended to be within the scope and spirit of the present invention.

Example 1

Six swatches (about 50.0 cm²) of each acetate comprising fabric described in Table I were cleaned, sets of three of each 5 in carbon dioxide, and sets of three of each in a hydrocarbon (Exxon 2000).

The three (3) swatches that were cleaned in carbon dioxide were placed in a cleaning chamber of a dry cleaning unit 10 suitable for cleaning with carbon dioxide. The dry cleaning unit was constructed in a manner described in U.S. Patent No. 5,467,492. The carbon dioxide was circulated in the machine at a rate of about 490 liters of liquid CO₂ per cleaning loop, and a storage tank was used to feed the unit with clean carbon 15 dioxide. The cleaning cycle lasted for about 15 minutes and the carbon dioxide was pressurized to about 850 psi at 10°C. Subsequent to the cleaning cycle, the liquid CO₂ was circulated back to the storage tank and the swatches were removed. The data in Table II depicts the percent dimensional change of the 20 acetate fabrics after cleaning with carbon dioxide.

When the three (3) swatches were dry cleaned in Exxon 2000, a commercial establishment with a commercially available Union petroleum dry cleaning machine was employed and all 25 cleaning conditions were as required by the State of New Jersey. The machine was charged with the acetate comprising fabrics and cleaned at a temperature of approximately 27°C. Subsequent to the cleaning cycle, which lasted about 45 minutes, the swatches were heated to about 40°C for 30 approximately 2 minutes to evaporate off any solvent. The data in Table II depicts the percent dimensional change of the acetate comprising fabrics that were cleaned in Exxon 2000.

The negative (-) numbers indicate shrinkage with a dimensional change of more than -1.7 being unacceptable (a shrinkage standard similar to the one described in ASTM
5 Standard Performance Specifications for Textile Fabrics, First Edition 1983).

Table 1^A

Swatches Made Commercially Available by TestFabrics of
10 Pittston, PA

Swatch	Material	Weight
100	Acetate satin	92g/m ²
1015	Acetate sand crepe	85g/m ²
105B	Acetate satin	169g/m ²
114	Acetate taffeta	125g/m ²
122	Acetate tricot	78g/m ²
154	Spun acetate suiting	164g/m ²

A = Acetate is defined to include manufactured fibers prepared from cellulose acetate, including secondary acetates and triacetates, all as described in Dictionary of Fiber & Textile
15 Technology, Introductory Textile Science (5th Edition); Textile World Man Made Fiber Chart-1996.

Table II^B

Swatch Material	Carbon Dioxide		Hydrocarbon	
	Fill	Warp	Fill	Warp
100	-3.4	-4.1	-1.0	-0.6
101S	-4.1	-2.0	-0.6	-1.0
105B	-1.8	-6.8	-0.7	-1.0
114	-1.9	-5.2	-0.7	-0.9
122	2.1	-10.6	-0.0	0.4
154	-0.7	-5.9	-1.7	-1.1

5 B = All swatches were marked at 30cm in both the warp and fill direction. After the swatches were dry cleaned, they were ironed and dimensional change was determined by measuring the change in the 30 cm marks and averaging the data over all the measurements for each style of fabric, the dimensional change
 10 being defined by AATCC test method 158.

Table III^C

Swatch Material	Carbon Dioxide	
	Fill	Warp
Nylon 6,6	0.0	0.0

15

C = The swatch material, Nylon 6,6 (made commercially available by DuPont) was cleaned in a manner similar to the one described in Example 1. Less than 40.0% acetate was present in the swatch and no shrinkage was observed after cleaning.

Claims

1. A method for conducting a laundry business comprising the steps of:

- (a) collecting soiled laundry fabric from a customer at a residential home or a customer at a business and transporting the soiled laundry fabric collected to a cleaning facility of the laundry business, or
- (b) gathering soiled laundry fabric from a central laundry drop off location, the central laundry drop off location being within the cleaning facility of the laundry business or at a location which is at a driving distance of the cleaning facility of the laundry business,
- (c) or both;
- (d) cleaning the soiled laundry fabric to produce clean laundry fabric; and
- (e) delivering the clean laundry fabric to the customer or allowing the customer to pick up the clean laundry fabric at a pick up location,

with the proviso that the laundry business is of the type whereby a first portion of soiled laundry fabric is cleaned with a dry cleaning technique that uses a densified gas and a second portion of soiled laundry fabric is cleaned with a dry cleaning technique that does not comprise carbon dioxide wherein the first portion of soiled laundry fabric does not comprise a portion having a blend with greater than about 40.0% acetate or a portion having about 100% acetate, or both.

2. The method for conducting a laundry business according to claim 1 wherein the soiled laundry fabric is a suit, coat, rug, slacks, curtains, upholstery or a shirt.
3. The method for conducting a laundry business according to claim 1 wherein the laundry business further comprises the step of isolating a third portion of soiled laundry fabric, the third portion of soiled laundry fabric not requiring drycleaning.
4. The method for conducting a laundry business according to claim 3 wherein the third portion of soiled laundry fabric is cleaned with water and a detergent.
5. The method for conducting a laundry business according to claim 1 wherein the densified gas is carbon dioxide.
6. The method for conducting a laundry business according to claim 5 wherein the densified gas comprises a surfactant.
7. The method for conducting a laundry business according to claim 5 wherein the densified gas further comprises a polar solvent.
8. The method for conducting a laundry business according to claim 1 wherein the dry cleaning technique that does not comprise carbon dioxide, does comprise a hydrocarbon.
9. The method for conducting a laundry business according to claim 8 wherein the dry cleaning technique that does not comprise carbon dioxide, does comprise a silicon comprising solvent.

10. A method for conducting a laundry business comprising the steps of:
- (a) accumulating soiled laundry fabric;
 - (b) isolating soiled laundry fabric with greater than about 40.0% acetate from soiled laundry fabric that does not comprise greater than about 40.0% acetate; and
 - (c) cleaning the soiled laundry fabric with less than about 40.0% acetate with carbon dioxide.
11. The method for conducting a laundry business according to claim 10 wherein the soiled laundry fabric that does comprise greater than about 40.0% acetate is cleaned with a system comprising a hydrocarbon or a silicon solvent.
12. The method for conducting a laundry business according to claim 11 wherein the silicon comprising solvent is a linear or cyclic siloxane.
13. The method for conducting a laundry business according to claim 10 wherein the carbon dioxide further comprises a surfactant, water and a reverse micelle.
14. The method for conducting a laundry business according to claim 10 further comprising the step of isolating soiled laundry fabric that does not require dry cleaning.
15. The method for conducting a laundry business according to claim 14 wherein the soiled laundry fabric not requiring dry cleaning is cleaned with water and a detergent.

16. A method for conducting a laundry business comprising the steps of:
- (a) accumulating soiled laundry fabric;
 - (b) isolating soiled laundry fabric with greater than about 70.0% acetate from soiled laundry fabric that does not comprise greater than about 70.0% acetate; and
 - (c) cleaning the soiled laundry fabric comprising greater than about 70.0% acetate with a solvent that does not comprise carbon dioxide.
17. A laundry business building comprising:
- (a) a pile of soiled laundry fabric comprising at least a portion having greater than about 40.0% acetate and a pile of soiled laundry fabric comprising less than about 40.0% acetate; and
 - (b) a dry cleaning machine capable of cleaning soiled laundry fabric with a densified gas.

INTERNATIONAL SEARCH REPORT

Inten Application No
PCT/EP 01/05508

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D06L1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 D06L C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 858 022 A (CAUBLE DAVID F ET AL) 12 January 1999 (1999-01-12) claims column 1, line 37 - line 50	1,2,5-7, 10,16
A	US 6 001 133 A (STOREY-LAUBACH BERNADETTE ET AL) 14 December 1999 (1999-12-14) column 6, line 20 - line 40; claims	1,2,5, 10,16
A	EP 0 679 753 A (HUGHES AIRCRAFT CO) 2 November 1995 (1995-11-02) claims	1,2,5, 10,16
X		17
A	US 3 653 656 A (STOBB ANTON R) 4 April 1972 (1972-04-04) claims	1,2,8,16
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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- *P* document published prior to the international filing date but later than the priority date claimed

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- *G* document member of the same patent family

Date of the actual completion of the international search 16 October 2001	Date of mailing of the international search report 24/10/2001
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Grittern, A

INTERNATIONAL SEARCH REPORT

Intern Application No
PCT/EP 01/05508

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 676 705 A (RESCH CAROL ET AL) 14 October 1997 (1997-10-14) cited in the application claim 1 -----	1,2,5
A	US 5 683 473 A (HARRIS ROSEMARIE ET AL) 4 November 1997 (1997-11-04) cited in the application claim 1 -----	1,2,5
A	US 5 683 977 A (RESCH CAROL ET AL) 4 November 1997 (1997-11-04) cited in the application claims -----	1,2,5

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern — Application No

PCT/EP 01/05508

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5858022	A	12-01-1999	AU 736088 B2	26-07-2001
			AU 8922098 A	16-03-1999
			EP 1007779 A1	14-06-2000
			JP 2001514337 T	11-09-2001
			WO 9910585 A1	04-03-1999
			US 6218353 B1	17-04-2001
			US 6200352 B1	13-03-2001
			US 6258766 B1	10-07-2001
US 6001133	A	14-12-1999	US 6228826 B1	08-05-2001
			AU 9038998 A	16-03-1999
			EP 1007780 A1	14-06-2000
			JP 2001514339 T	11-09-2001
			WO 9910587 A1	04-03-1999
			US 6010542 A	04-01-2000
EP 0679753	A	02-11-1995	US 5467492 A	21-11-1995
			CN 1119684 A	03-04-1996
			DE 69520012 D1	08-03-2001
			DE 69520012 T2	06-09-2001
			EP 0679753 A2	02-11-1995
			JP 8052297 A	27-02-1996
			KR 131842 B1	16-04-1998
US 3653656	A	04-04-1972	NONE	
US 5676705	A	14-10-1997	AU 4942996 A	23-09-1996
			CA 2211412 A1	12-09-1996
			WO 9627704 A1	12-09-1996
			EP 0813628 A1	29-12-1997
			FI 973603 A	05-09-1997
			TR 9700901 T1	21-02-1998
			US 5683473 A	04-11-1997
US 5683473	A	04-11-1997	US 5676705 A	14-10-1997
			AU 4942996 A	23-09-1996
			CA 2211412 A1	12-09-1996
			WO 9627704 A1	12-09-1996
			EP 0813628 A1	29-12-1997
			FI 973603 A	05-09-1997
			TR 9700901 T1	21-02-1998
US 5683977	A	04-11-1997	AU 4942996 A	23-09-1996
			CA 2211412 A1	12-09-1996
			WO 9627704 A1	12-09-1996
			EP 0813628 A1	29-12-1997
			FI 973603 A	05-09-1997
			TR 9700901 T1	21-02-1998
			US 6148644 A	21-11-2000
			US 6131421 A	17-10-2000